What is claimed is:

1. A material processing system comprising:

a processing tool, wherein the processing tool includes at least one process chamber;

a test signal source coupled to the process chamber, the test signal source providing a first test signal and a second test signal;

a filter/detector for detecting an intermodulation product of the first test signal and the second test signal; and

a controller coupled to the filter/detector and the processing tool, the controller comprising means for determining when a plasma is created using the detected intermodulation product.

2. The material processing system as claimed in claim 1, wherein the first test signal and a second test signal are at different frequencies.

3. The material processing system as claimed in claim 1, wherein the first test signal and a second test signal are at the same frequency.

4. The material processing system as claimed in claim 1, wherein the test signal source comprises a first source for providing the first test signal, a second source for providing the second test signal, summing circuit for combining the first test signal and the second test signal, isolation amplifier for amplifying the first test signal and the second test signal, and antenna for transmitting the first test signal and the second test signal, wherein the antenna is coupled to the process chamber.

5. The material processing system as claimed in claim 1, further comprising:

an RF bias source configured to provide an RF bias signal; and

an RF subsystem coupled to the process chamber, coupled to the RF bias source and coupled to the test signal source, wherein the RF subsystem comprises means for combining the first test signal, the second test signal, and the RF bias signal and means for providing the first test signal, the second test signal, and the RF bias signal to the process chamber.

6. The material processing system as claimed in claim 5, wherein the RF bias signal is used to generate plasma and the first test signal and the second test signal are not harmonically related to the frequency of the RF bias signal.

7. The material processing system as claimed in claim 1, wherein the filter/detector comprises an antenna coupled to the process chamber, a filter coupled to the antenna, and detector coupled to the filter, wherein the filter comprises a bandpass filter (BPF) configured to pass at least one intermodulation product of the first test signal and the second test signal.

8. The material processing system as claimed in claim 7, wherein the at least one intermodulation product of the first test signal and the second test signal comprises an odd-order product.

9. The material processing system as claimed in claim 8, wherein the at least one intermodulation product of the first test signal and the second test signal comprises a fifth order product.

10. The material processing system as claimed in claim 8, wherein the at least one intermodulation product of the first test signal and the second test signal comprises a seventh order product.

11. The material processing system as claimed in claim 1, wherein the filter/detector further comprises a power source coupled to at least one of the antenna, filter, and detector.

12. The material processing system as claimed in claim 11, wherein the power source comprises at least one of an RF-to-DC converter configured to convert energy emitted from a process related signal into a DC signal, an RF-to-DC converter configured to convert a non-process related signal into a DC signal, a DC-to-DC converter, and a battery.

13. The material processing system as claimed in claim 1, wherein the filter/detector further comprises a controller coupled to at least one of the antenna, filter, and detector.

14. The material processing system as claimed in claim 13, wherein the controller comprises at least one of a microprocessor, a microcontroller, a timer, digital signal processor (DSP), memory, receiver, A/D converter, and D/A converter

15. The material processing system as claimed in claim 1, wherein the test signal source further comprises

a first source providing a first signal at least one frequency;

a second source providing a second signal at least one frequency;

a summing circuit for combining the first signal and the second signal;

an isolation amplifier coupled to the summing circuit for amplifying the first signal and the second signal; and

an antenna coupled to the isolation amplifier for transmitting the first signal and the second signal into the process chamber.

16. The material processing system as claimed in claim 15, wherein the first source and the second source comprise sine wave oscillators.

17. The material processing system as claimed in claim 1, wherein the test signal source further comprises a power source coupled to at least one of the antenna, filter, and detector.

18. The material processing system as claimed in claim 17, wherein the power source comprises at least one of an RF-to-DC converter configured to convert energy emitted from a process related signal into a DC signal, an RF-to-DC converter configured to convert a non-process related signal into a DC signal, a DC-to-DC converter, and a battery.

19. The material processing system as claimed in claim 1, wherein the test signal source further comprises a controller coupled to at least one of the antenna, filter, and detector.

20. The material processing system as claimed in claim 19, wherein the controller comprises at least one of a microprocessor, a microcontroller, a timer, digital signal processor (DSP), memory, receiver, A/D converter, and D/A converter

21. A method of determining the presence or absence of a plasma in a plasma processing space within semiconductor processing system comprising:

coupling at least two RF signals into a processing space;

coupling, from the processing space, the input of a detector configured to detect plasma-produced intermodulation products of the at least two signals.

22. The method as claimed in claim 21, wherein the intermodulation products include at least one odd order intermodulation product of the at least two signals.

23. The method as claimed in claim 21, wherein the at least two RF signals are from 10 MHz to 1500 MHz.